Mattress

The present invention relates to bedding apparatus, and more particularly relates to mattresses with enhanced heat dissipation properties.

WO01/00064 discloses a unit for supporting a baby. The unit includes a supporting surface. The surface is shaped so that when a baby is supported on the surface, the baby's normal anatomical cervical spine curvature is maintained. The supporting surface may have first and second parts, the first part being adapted to accommodate the head, and the second part being adapted to accommodate the remainder of the body of the baby. The first and second parts may be disposed relative to one another so as to support the back of the baby's head in a position posterior to the upper part of the remainder of the baby's body. The first part may define a cavity. The supporting surface may be surrounded by a peripheral wall. The unit may be a mattress but could also be a chair.

It is well established that it is undesirable for persons to experience overheating while sleeping, and the especially so in the case of babies and small children, whether in a bed, cot, Moses basket, etc. The human body is a heat source and, when surrounded by bedding materials, will experience overheating if the heat is not allowed to dissipate.

Previously, certain techniques have been proposed that attempt to address the somewhat different problem of suffocation avoidance. US-A-5,561,879 discloses a mattress for supporting an infant in a supine position during sleep. Breathing apertures (holes) are directed through an inclined headwall of a main cushion member an through a pair of lateral guides to preclude blocking of the infant's breathing during sleep, and reduce the risk of infant sleeping death.

In US-A-4,536,906 there is disclosed a mattress for children with a removable insert. The insert has a plurality of perforations extending from its top face to its bottom face that reduce the risk of suffocation.

However, a problem with known mattresses is that at most they are concerned with getting enough air to the person (e.g. child, baby) for unimpaired breathing. They do not provide a

means of increasing or optimising the taking away of heat (embodied in warm air) from the person.

There is a need for a mattress that overcomes the aforementioned problems and provides improved heat flow characteristics.

The present invention provides a mattress, comprising: a resilient body having at least one upper surface portion for supporting, in use, a person; and a plurality of surface channels disposed in the or each upper surface portion and extending parallel thereto.

Preferably, the body has an axis of elongation corresponding to the head-to-toe direction of the person lying, in use, on the mattress, and at least one upper surface portion is inclined relative to the axis of elongation.

Preferably, at least some of the surface channels have a component of direction, along at least a portion thereof, parallel to the the direction of rising incline of the respective surface portion. Preferably, at least some of the surface channels have a component of direction, along at least a portion thereof, parallel to the axis of elongation.

In a preferred embodiment, at least some of the surface channels extend substantially diagonally so as to make an angle of less than 90° with the axis of elongation. In certain embodiments, at least some of the surface channels have a non-linear path, when viewed from above. The surface channels may have any transverse dimension at the surface that is sufficient to achieve effective dissipation of warm air. Suitably, by way of example, this transverse dimension is about 4 to 15 mm. The surface channels are suitably spaced apart at the surface by any distance that is suitable to accommodate the surface channels but does not adversely affect the ability of the surface to support a person. Suitably, by way of example, this spacing is about 5 to 20 mm. The surface channels may have a transverse cross-sectional area that varies along the length of the channel, for example increasing in size with proximity to the sidewalls of the resilient body. Preferably, for one or more of the surface portions, said surface channels are provided over substantially the entire surface area thereof. In certain embodiments, the surface channels are distributed over substantially the entire surface area of said surface portions.

Preferably, the body comprises sidewalls adjacent said at least one surface portion, the mattress further including at least one connecting channel, the or each connecting channel

being in communication with a plurality of said surface channels and with at least one sidewall. Suitably, the or each connecting channel is disposed in the or each upper surface portion. The connecting channels may include a connecting channel extending centrally parallel to said axis of elongation, and/or include a connecting channel extending substantially transverse to said axis of elongation.

In one embodiment, the upper surface portion includes a body surface portion, for supporting, in use, the body of a person, a head surface portion, for supporting, in use, the head of a person, and/or a top surface portion. In this case, a connecting channel extending substantially transverse to said axis of elongation extends along the lowermost region of said head surface portion.

An advantage of the present invention is that the surface channels in the inclined surface portions extend away from the person's body in an upwardly-rising manner. Thus, due the natural effect of warm air rising, the air warmed by the body passes along and up the surface channels and out to the atmosphere, where possible via a connecting channel. A further advantage of the invention is the possibility of reducing sudden infant death, to the extent that this is caused by overheating.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a mattress in accordance with one embodiment of the invention;
Figure 2 shows (a) a cross sectional view at II-II of the mattress of Fig. 1, and (b) a lateral view of the mattress of Fig. 1; and
Figure 3 illustrates a cross-section of the surface channels in a mattress accordance with another embodiment of the invention, (a) at or near the midsection, and (b) at the exterior sidewalls.

As used herein, "mattress" is taken to mean any type of resilient object for supporting a young child or baby, and which includes, among other things, mattresses for traditional beds, cots, cribs, bassinets, prams, pushchairs, or for Moses baskets, seats of various kinds, and so on. In this respect, although the invention is advantageously employed for children of various ages, it is particular beneficial for babies and children up to the age of

about 3 years. At the same time, the invention would provide similar benefits to adult users when embodied in an adult-size mattress.

Figure 1 is a perspective view of a mattress in accordance with one embodiment of the invention. In this example, the mattress is designed for a very young child or baby. In this embodiment, the mattress (generally designated 2) has a rectangular base 4 and has generally planar sidewalls 6, and top and bottom walls 8, 10 respectively. As can be seen, the mattress 2 has an axis of elongation, partially indicated at 12. Suitably, the mattress 2 may be made of polymer foam, or other suitable material, as is well known in the art in the manufacture of mattress/cushion products, and shaped using conventional injection moulding techniques.

In this embodiment, the mattress 2 comprises three sections arranged along the axis of elongation 12 — a body section 14, a head section 16 and a top section 18. Some or all of the sections 14, 16, 18 may be "scooped out" to provide a generally concave cross-section relative to the base 4, i.e. so that the thickness of the mattress 2 at the sidewalls 6 is greater than at the centreline 12: this helps to maintain the person lying on the mattress in a stable position. In use, the body section 14 supports the body of the person (e.g. baby or young child), and the head section 16 supports the head of the person.

In preferred embodiments, the general configuration of the mattress 2 is a wedge shape. Thus, the body section 14 has an upward incline as you move along the centreline 12 from the foot to the head of the person. Top section 18 may be flat or have a gentle incline in either direction. However, the head section 16 has a generally partially cylindrical cross-sectional shape (viewed transversely to the centreline 12); and the head section comprises a first part 20 and a second part 22. The first part 20 is inclined in the same direction as the body section 14, whereas the second part 22 is inclined in the opposite direction. The shape of the head section 16 beneficially enables the person's head to move freely from side to side during use, and this is facilitated by notches 23 (one of which, in use, is located generally below the neck of the person).

There is provided on the surfaces 24, 26, 28 of the section 14, 16, 18, respectively a pattern of surface channels 30. The surface channels 30 are elongate channels that may extend in a straight or curved manner, and may have a U-shaped, or (part-) circular, elliptical, square, rectangular (or any other suitable) cross-sectional profile. Suitably, the cross-sectional dimensions of the surface channels 30 are about 4 to 15 mm in width and about 4 to 15 mm

in depth. Suitably, each surface channel 30 is separated from an adjacent surface channel on the surface by about 5 to 20 mm. However, it will be appreciated by persons skilled in the art that other shapes and dimensions, as alternatives to the above, may be employed, while producing the same of similar effects.

Also provided on the upper surface of the mattress 2 is a central connecting channel 32 that extends parallel to the centreline 12, and several transverse connecting channels 34, 36, 38, 40 that are generally at right angles to the centreline 12; and all of these may have the same or similar shape and dimensions to those of the surface channels 30.

On each of the surfaces 24, 26, 28, the surface channels 30 have a component of direction transversely (i.e. towards the sidewalls), and they have a component of direction in the direction of upward incline of the surface. In other words, viewed from above, the surface channels extend diagonally (e.g. at about 45° to the centreline 12; although the angle may be anything up to 90 °). Indeed, the surface channels 30 may simply comprise a series of parallel channels extending at right angles to the centreline 12. Optimally, however, the surface channels 30 follow a path that provides the shortest path for warm air to the ambient atmosphere; the channels 30 may therefore follow a non-linear, curved path.

The beneficial effects during use of the mattress will be described by considering the surface 24. This is substantially covered, in use, by the person's body (not shown). Air that is adjacent the persons body is warmed by the body. Through the natural physical effect of warm air rising against the force of gravity, this warm air has to pass in an upward direction along the surface channels 30 until it reaches the ambient atmosphere. Thus, in each of the surface channels 30 covered by the person's body (to the extent that they are covered), the warm air travels in the direction of arrows A and escapes into the ambient atmosphere, either directly upwardly, or through the ends points 44, or to a connecting channel 34.

A similar effect occurs on the other surfaces 26, 28, to the extent that they are covered by the person's head, neck or body: warm air travels in the direction of arrows B, C, D and escapes into the ambient atmosphere, either directly upwardly, or through the ends points 44, or to a connecting channel 34, 36, 38, 40. The overall effect is that heat from the person's body is efficiently taken away and dissipated into the atmosphere.

The source of incoming cold air (to replace the dissipated warm air) is either along the central connecting channel 32, and/or from below the mattress 2 in the event that the mattress 2 is formed of air-permeable foam.

Figure 2(a) shows a lateral view of the mattress of Fig. 1. It illustrates the distribution of (surface channel 30) end points 44 along the upper surface of the mattress 2. Figure 2 (b) is a cross sectional view at II-II of the mattress of Fig. 1. This illustrates the junctions of the distributed surface channels 30 with the central connecting channel 32, enabling inflow of cool air and outflow of warm air.

Figure 3 illustrates a cross-section of the surface channels in a mattress in accordance with another embodiment of the invention, (a) at or near the midsection, and (b) at the exterior sidewalls. It can be seen that the cross-sectional profile of the surface channels 30 (here, substantially U-shaped) may, in certain embodiments, be of greater dimensions (Fig. 3(b)) at the exterior sidewalls 6 in Fig. 1 than those (Fig. 3(a)) at the central connecting channel 32. In this way, the flow of warm air out of the surface channels 30 can be improved.

It will be appreciated by persons skilled in the art that numerous variants are possible. Although the surface channels 30 have been described herein as extending to the sidewalls 6, in certain embodiments the channels may only extend part way to, and terminate short of, the sidewalls 6.

Also, the mattress in accordance with the invention is suitable enclosed within a fabric cover (not shown). Preferably, this cover is made of an air-permeable, heat-porous, antibacterial non-woven fabric.